Accelerator Systems Division Highlights for the Week Ending August 3, 2001

ASD/LBNL: Front End Systems

The first of two 80-kW/2-MHz RF amplifiers for the ion source has been tested and found to work very well up to full duty factor, sustaining the ion-source discharge and facilitating beam production. It will be part of the final ion-source equipment to be shipped to Oak Ridge.

The Integrated Testing activities in Building 71 have been put on hold for one month, and the scheduled 'Blue-Box' re-arrangement work has started. Purpose of this effort is to improve the operational reliability of the ancillary systems serving ion source and LEBT and to finalize their packaging. A new base plate for equipment on high potential has been completed by the LBNL shops.

The second ion-source test stand, in Building 16, has been prepared for continuation of the antenna tests using the 2-MHz rf amplifier that was removed from the Blue Box and a nearly identical matcher configuration (inductive 2-MHz and capacitive 13.56-MHz) as recently used in Integrated Testing.

RFQ Module #4 is being prepared for bead pulls utilizing the final end cap; the cavity is now completely leak tight.

All MEBT profile-monitor boxes have been machined and passed the leak tests; one of them has been received by BNL to house the first wire profile monitor.

Rf conditioning of the first MEBT rebuncher cavity is continuing; a radiation assessment established that 3 sheets of 3/8" lead are sufficient for shielding. We expect that the shielding needs can be substantially relaxed once the cavity is fully conditioned.

The Estimate-To-Complete information for the Front-End Systems has been collected and is being prepared for submission.

L. Doolittle attended the design reviews on timing and the 805-MHz LLRF systems in Los Alamos and visited the subcontractor fabricating MEBT rebuncher cavities # 2 - 4, to get a status update.

ASD/LANL: Warm Linac

LANL held a Timing System review this week that enjoyed active participation by the various partner labs via video-conferencing. Dave Gurd organized the review and considered it quite successful.

LANL also conducted a Final Design Review on the Super Conducting Low Level RF system. This was an excellent review with a recommendation from the design review committee to proceed with SC LLRF design.

The High Voltage Converter Modulator (HVCM) Transformer is being hooked up to drive the prototype HVCM. We had an earlier setback with poor potting of the high voltage lead between the transformer and the HVCM. The lead has been repotted and completion of the transformer installation should take place next week.

The Source selection Board for the CCL procurement met this week to select a vendor for the CCL RF structures. The Board is composed of LANL, ORNL and FNAL representatives. The proposals were evaluated on the basis of a best value procurement and a vendor was selected for recommendation to the procurement group.

CCL Hot Model ready for testing

Excellent progress is being made in the conditioning of the CCL Hot Model with RF power this week. Currently it is being pulsed at 3.5 kW at 20Hz with 1msec pulses. Testing is scheduled to continue through August 20 after which time RF power will be needed for the Jlab SC couplers.

Progress continues no the DTL BPMs. Work began on the FPGA's needed for the DFE daughter board for the BPMs. Several errors have been found with the DFE PC board, so another rev. will be needed - hopefully after the FPGA testing is complete. Brazing is complete on the DTL pickups now in fabrication.

LANL has submitted a request for an additional $18.9M in Budget Authority for FY 01 to accelerate the schedule by pulling work forward from FY-02 and to address phase funded procurements. ORNL has committed to support $7.3M of this request and to continue to look for more funding through the remainder of the year. LANL is also in the process of preparing Advanced Procurement Plans for FY-02.

LANL experienced a problem with the impedance of the Chopper meander line. It was determined that the vendor had not fabricated the copper meander line to all of the proper dimensions. A new set of meander lines have been ordered and an expedited fabrication schedule has been developed to attempt to hold the ship date to LBNL of October 1.

ASD/JLAB: Cold Linac

All 2K supply transfer line bayonets (31), shield return bayonets (32), and 6 of 32 shield supply bayonets (3 expansion box, 3 anchor box) have been completed and shipped to SNS for transfer line fabrication.

Fabrication of remaining transfer line components continues.

Welding of cavity #4 is complete. Chemical processing of prototype medium-β cavity #2 is complete. Cones for stiffening prototype and first article helium vessel heads have been received.

Fundamental Power Coupler activity is still on schedule to ship the equipment to LANL for testing on August 4.

Award of the cavity production contract is imminent. It is presently undergoing local Procurement review.

Installation of infrastructure support for the test stand continues.

ASD/BNL: Ring

Work continues on “ETC” for all WBS 1.5 systems.

Staff are busy working on year-end planning for the FY01/FY02 fiscal year closeout and transition.

Preparations are underway for the upcoming ASAC review.

RTBT 1st article collimator – vendor bid submittals and a pre-award visit by W. Birkholz and N. Simos are being evaluated by BNL and ASD for a double wall inconel vacuum beam pipe proposal. We expect to award this contract to SDMS, France, shortly.

The SOW and spec package for the 30Q44 and the 30Q58 quadrupole magnets were released this week for RFQ. Bids are due back by August 24.

To date, ten (10) production Ring dipole magnets have been assembled and surveyed. Field quality measurements of these production magnets will begin in late September.

Our vendor (SDMS) reports that vacuum chamber #2 for the Ring arc dipole magnets is finished and is being prepared for shipment to BNL.

QA of the 1st article vacuum chamber for the HEBT dipole is complete. This 6 meter vacuum chamber is being made ready for shipment to SNS/OR. Remaining production units will be sent directly to SNS/OR from the vendor’s plant.

Joe Tuozzolo and Viorel Badea traveled to New England Techni-Coil, New Hampshire, for a pre-production technical review of the 21CS/CO26 corrector magnet package.

Brian Oerter traveled to LANL this week to participate in a final design review of the SNS timing system.

Work continues to install a laser wire scanner into the Linac-to-AGS transfer line for additional real time testing.

BNL Shops have finished production of all the type #1 (long) half-cell Ring arc magnet bases (skids).

Controls:

Recommendations for Davis-Bacon determination for cabling, racks, and controls were generated.

The FDR for the Timing System was held at LANL. Approval was given to proceed, although resolution of a slew rate issue for the neutron choppers remains. The main concern of the review committee was better definition of related software – this review was limited to the hardware design.

Considerable work went into developing the ETC for WBS 1.9 at each level three, with particular progress for WBS 1.9.4 and 1.9.5. Uncertainty about plans for Beam Instrumentation is limiting progress.

First article boards for the PSI and PSC were received at BNL.

Cabinet wiring diagrams for Target utilities PLCs and instruments is continuing. These should be complete by the end of August.

First-article testing of the standard SNS 7-slot VME crate was completed at ORNL. The supplier (Dawn VME) is working on the problems we found.

It was discovered at the vendor Design Review for the 4K cold box that the amount of effort (and to some extent material) necessary for the ICS interface to the 4.5 K cold box is greater than the baseline estimate. The PLC for this subsystem will depart from our basic assumption that all sequences and control loops are in the IOC. These changes will be reflected in a PCR to be prepared.

A purchase order for the procurement of all VME IOC modules required to interface the silicon diode temperature sensors to the EPICS system was issued.

Bids on the Chipmunk radiation detector prototypes have been received and reviewed. The bids were technically responsive and within budget. A recommendation for award has been sent to purchasing and we expect the award to be made next week.

The software group has developed a test EPICS operator screen that displays variables from the PPS PLC development system.

At Berkeley, new driver and sequencer applications were completed to operate Tektronix 4-channel scopes over Ethernet/fiber at 5-10Hz refresh rates for Source/LEBT waveform monitoring. This runs about 5x faster then Tektronix's own demo on a PC -- another win for EPICS! Almost all of the middle .db and high-level sequencer and operator screens were re-usable.

ASD/ORNL: Integration

Installation Support

A videoconference has been scheduled for 8/13 to discuss cryomodule acceptance criteria with JLab.

Accelerator Physics

Continued work on ring impedances has focused on the resistive wall impedance at low frequencies, which drives transverse instability. The possibility of raising the instability threshold with chromaticity has been explored. With the natural chromaticity the instability threshold is a factor of seven higher than with zero chromaticity.

Using a model for the injection kicker impedance developed by S. Danilov, the impedance of the coated ceramic injection kicker system was estimated and found to increase the transverse impedance of the ring at low frequencies by a factor of four. A recommendation was put forward which reduces the transverse impedance of the coated ceramics by a factor of six. Additional coating schemes are under consideration.

A draft is in preparation, which summarizes the radiation dose measurements performed recently at LANSCE of the first two DTL tanks. These results will bear on personnel protection at the SNS Linac.

D. Jeon continues mismatch studies in the linac with Ingo Hofmann.

The three-dimensional space charge implementation in the ORBIT tracking code has been benchmarked and gives reasonable results. The code is being parallelized.

Operations

Attended reviews on Timing System, LLRF and Experimental Systems Computing and Network Requirements.

Continued RAMI work.

Directed HR to hire a candidate for the Operations Coordinator position.

Directed HR to hire a candidate for the Chief Operator position.

Ion Source Group

Extensive efforts by Rahul Rauniyar allowed for a comparison between measured emittances and emittances calculated with PBGun. The obtained good agreement gives us the confidence that we can predict emittance changes, which can be expected from modified designs.

Cherokee Porcelain has coated 10 sample antenna structures to refine operations.

Antennas coated by Cherokee Porcelain using different recipes were cut and polished and investigated by Sonali Shukla.

Rob Welton completed an extensive analysis of the electrical, thermal and mechanical stresses, which affect the antennas. He identifies the importance of matched thermal expansion, high fracture strength, and low elastic modulus. But most important is the thickness of the antenna coatings, which should be substantially increased. Proposed hi-potting could provide the quality control to eliminate short-lived antennas.

RF Group

Marion, Pam, Hengjie, Yoon were at LANL attending 3- different reviews. Controls, low level RF and Yoon was a reviewer for a LEDA project. 402.5 waveguide pieces keep arriving at the Rats. The HVPS for the Jlab RF system is out for bid; they are due back in another week. Sang-Ho is making good progress on resurrecting the CWDD crowbar, and adding energy storage. Long lead items are ordered. Mark Champion 1st day will be on the 6th.

Cryo Transfer Line Group

We have completed the last of the 4-40' 16 inch diameter return transfer lines.

We are starting to assemble the 2nd 40' 6 inch diameter supply transfer lines.

Mechanical Group

Magnet Measurement Group

There is an ongoing effort on the HEBT 8D533 dipole measurement system. The first magnet is scheduled to arrive in September. We plan to be ready for that event.

Power Supply Group

Power supply group acquired hardware for Lock and Tag and is available for RF and other groups.

Work on installation procedures and selection of hardware for magnet connections is underway for LANL and BNL magnets.

Installation planning estimates have been completed for Accelerator and Ring power supplies.

Survey and Alignment Group

Beam Diagnostics Group

General: System Specialists are preparing cost to complete estimates for all WBS's.

1.5.7.1 BPM: PUE machining for all SNS BPMs has been released to the shops.

1.5.7.2 IPM: Unexpected ringing has been observed in RHIC IPMs. Efforts to understand and remedy this are in progress.

1.5.7.3 BLM: Working with electrical design group on a PCB layout for the prototype BLM FE stage. Evaluating different packaging models of the OPA627 to determine which is best for input guarding issues. Four (4) additional BLMs were installed in the RHIC Ring near the RF cavities to look for X-Ray sensitivity.

1.5.7.4 BCM: Worked on s/n estimate to compare with data taken using the prototype circuit board. Made some noise measurements on the present circuit board. Measurements were about 3.5mV rms compared to about 2.7mV calculated. To reduce the noise, a circuit board layout for a different protected preamplifier has been completed and we expect to get it fabricated outside BNL next week. Started to investigate the switched amplifiers. Did a sensitivity analysis to determine the sensitivity of the droop, using the compensation algorithm, to errors in the sampling period (about 0.6%).

1.5.7.6b Laser Wire Scanner: We are working toward installing a LPM in the BNL Linac HEBT Line next week. The installation will require several tunnel accesses, which complicates the process. The intent is to complete the vacuum installation on Monday, and to follow up with cable installation as access permits. New final optics have been worked out to give a long narrow line focus parallel to the ion beam. This is to lower the power density on the beam stop, as well as increasing ionization efficiency and improving profile resolution.

LANL-SNS Beam Diagnostics Report:

BPMs: Fabrication continues on the (4 each) DTL BPM pickups. The delivery date is predicted to be Aug. 20. The prototype CCL pickup is now out for bids. The prototype SCL pickup is ready for bids. The cable we expect to use for the DTL pickups inside the drift tubes is expected next Tuesday. We have ordered a variety of different SMA connectors to determine the best one for replacement of the Teflon inserts for the DTL pickup cables. The design of the FPGAs for the digital front end (DFE) is complete. The chips should be ready for installation on the DFE board soon. The next rev. of the DFE board is almost ready for fab. Tests of the analog front end began yesterday.

WSs: Calculations of wire heating show that tungsten is not a good option for the SCL at the worst-case energy of

294 MeV (for 1-mil dia. wire). It would work for chopped beams at the reduced peak current of 38 mA, but not for higher currents. New results from the LEDA experiment show no evidence for oblation of carbon wires when they are not run red hot, so they may yet be an option for the SCL. Work continues to design the forks for the wire scanner actuators. Delivery of the Huntington prototype actuator has been delayed a couple weeks.

D-plate: Detailing and dimensioning work started last week. This work is expected to be completed in 7 to 10 weeks. Work began on designing the utilities junction box and the wire list. Trace3D calculations show that the beam density at the beam stop could be as much as 14 times higher than nominal if the quad is mis-tuned. Mechanisms must be put into place to prevent this occurrence.

CMs: The DTL CM price quote is about 3 times higher than expected. Negotiations are in progress.

ORNL-SNS Beam Diagnostics Report:

Craig prepared a summary report of the Fast Faraday cup. We submitted a request for the long lead-time items to the ASD management. This may allow us to have the Faraday cup proto-type ready prior to MEBT commissioning at Berkeley. Dave is adding features to the MEBT edm screens. His translation of Berkeley's screens is nearly complete. Saeed and Tom discussed how multiple diagnostic systems could be used to make higher quality measurements. Saeed will write an initial emittance program using Matlab to check the data acquisition and transport prototype. Tom and Dave attended the timing review videoconference. Tom and Craig attempted to participate in the LLRF review via audio alone – it was nearly impossible to follow the discussions. All ORNL group members attended the installation meeting. Tom is organizing the installation planning and handoff from the partner labs to ORNL. Work on the laser wire document continues, with input from the partner labs due on Monday, August 06, 2001.